Down into the Ground...

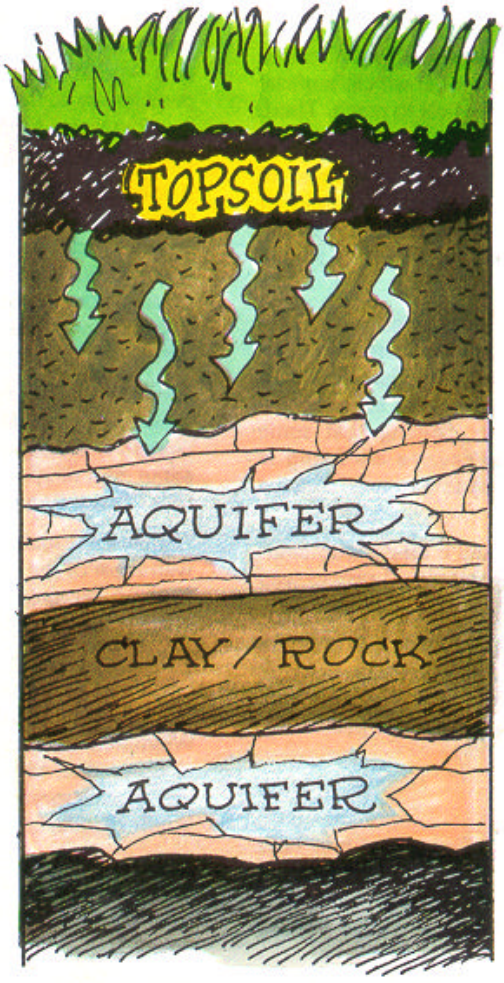
Now that we've seen what happens to water above the ground, it's time to go down below. Yes, there's water under the ground. And it's called groundwater. Pretty clever name, huh?

Groundwater comes from surface water that trickles down into the earth. Sometimes what happens is that rain soaks into the ground. Other times the rain flows into streams, lakes and marshes, then soaks in.

Along the surface of the ground is topsoil. Most people just call it dirt, and it is made up of sand, clay and rocks, plus decayed plant matter from things like leaves and grass that have died and gotten mixed in with the soil.

When water first soaks into the ground, it goes into this layer of soil. People in the water business say that water percolates into the soil. It soaks down into underground rock formations called aquifers. This is where the water collects, and where we collect most of our groundwater.

Aquifers can be fairly close to ground level, or buried hundreds of feet deep. The area along the top of the aquifer, closest to the surface of the ground, is known as the water table. If somebody says the water table is 100 feet, you know that's how deep you have to drill to find an aquifer in that spot.



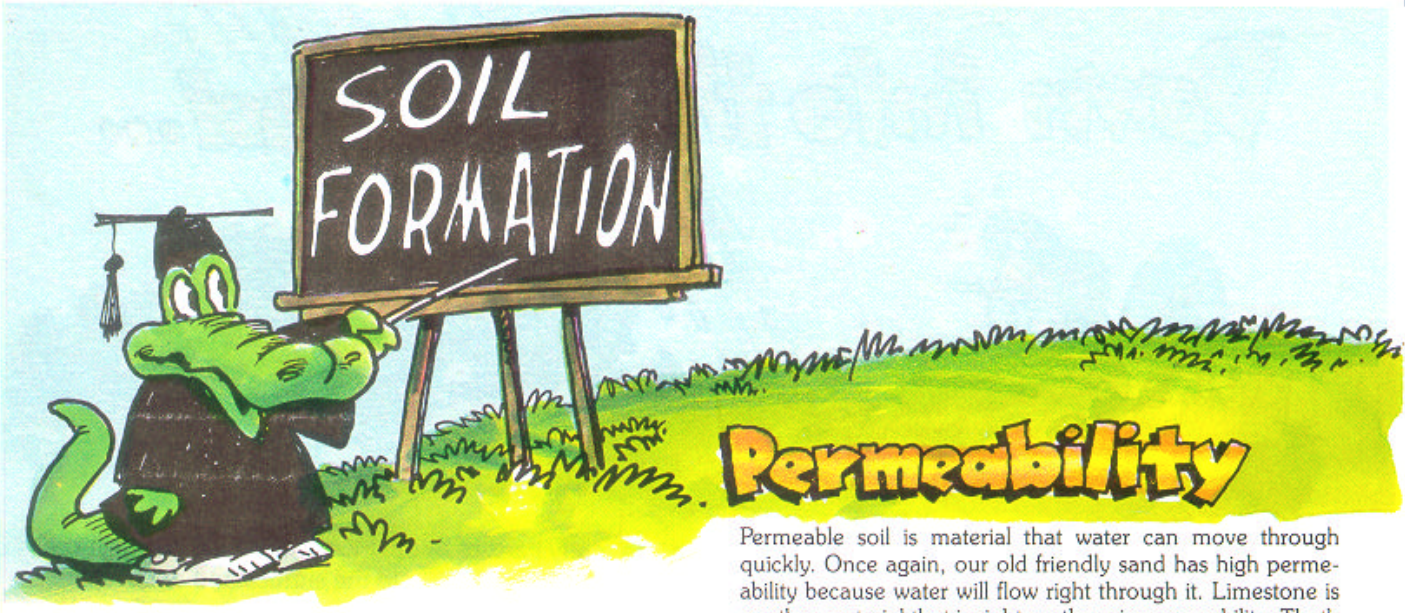
In many parts of South Florida there are two or more aquifers — one close to the surface and another one deeper in the ground. Usually a layer of rock or clay separates aquifers.

Sometimes underground spaces form in aquifers — and water collects in these openings. These underground cavities are called caverns. Once in a while when water is pumped out of these caverns, the weight of the ground above makes them collapse. If the ground above sinks down into the cavern, a depression can form on the surface above. This is called a sinkhole.

Usually, the way we get water from aquifers is to drill a well. In fact, in our end of the state most of the water we use comes from wells. You may have seen a well being dug. The drilling rig used to dig wells cuts a hole in the earth, usually smaller around than a telephone pole.

The rig brings dirt up out of the ground, creating a shaft. Well drillers line the shaft with pipe to keep soil and polluted water from getting into the aquifer. Then a waterproof electric motor is lowered into the well to pump the water to the surface.

Wells can produce anywhere from a few thousand gallons of water per day up to several million gallons.



Remember I said that there are two or more aquifers under the ground in some parts of South Florida? Well, the reason for that is what they call soil formation. Let me explain.

Soil and rock formations are found in layers in South Florida. Close to the surface in many areas are what we call surficial aquifers. These are the ones that are easiest to reach. Then, deeper in the ground, sometimes you'll find another aquifer.

In Florida, aquifers are made up mostly of two types of material. One is sand. The surficial aquifers are examples of sandy aquifers. We find water in these sandy underground deposits because sand is not solid and there is space for the water to collect.

The deeper aquifers usually are made of limestone. This is a kind of rock that has lots of spaces in it where water can collect. Limestone is interesting stuff because it dissolves slowly in water. That's part of the reason why there are so many spaces in the limestone. Remember reading that some aquifers have caverns? Well, usually caverns are found in limestone aquifers, because the limestone dissolves, creating the openings.

Limestone is also brittle, which means it cracks into small pieces. These cracks make it even easier for the water to seep into all the spaces.

There are two characteristics that make certain soils good for aquifers. The soil must be able to hold large amounts of water, and it must "give up" the water easily. Soils that have both of these characteristics are said to be porous and permeable.

Porosity

Porous soil is material that has a lot of spaces in it to hold water. Porosity is based on the size of the soil particles and on the spaces in between the particles. Sand, for example, is made up of fairly large grains with lots of spaces. We say sand has high porosity.

Another type of soil that has high porosity is clay, which has lots of particles with spaces in between. A hard rock is an example of a soil that isn't very porous, because there is very little space for water.

Permeability

Permeable soil is material that water can move through quickly. Once again, our old friendly sand has high permeability because water will flow right through it. Limestone is another material that is right up there in permeability. That's because of all the cracks that allow water to seep through.

On the other hand, while clay is porous, it is not very permeable. Imagine trying to pour water through a lump of clay — good luck! The problem with clay is that the soil particles are so fine that they are packed together too closely to allow water to pass through easily. Stuff that water can't pass through quickly, like clay and rock, is called impermeable.

If you could cut a slice deep through the earth, and look at it from the side, you would see layers of different kinds of soils that built up over millions of years. On the top would be — you guessed it — topsoil. Under that would be layers of rock, sand, clay or limestone. Exactly what you would find would depend on where you dug, because what's underground differs a lot from one area to the next.

Aquifers are the layers of porous, permeable material, like sand and limestone. The water in an aquifer stops soaking deeper into the ground because of an impermeable layer of some kind directly under the aquifer. This could be clay or rock. These impermeable layers are called confining units.

Aquifers are really important to us because they supply us with most of the water we use in South Florida — about 90 percent. But those aquifers don't have an endless supply of water. The amount of water in the aquifers depends on rainfall.

Luckily, even though we keep pumping water out of aquifers, more water trickles down into them from rain or surface water. When new water replaces water which has been pumped out of an aquifer, they call it groundwater recharge. Rainfall is the most important source of recharge to the aquifer in South Florida.

It's important not to take too much water, because we can pump it out faster than nature can recharge it. And, if our aquifers were ever to go dry, we'd be in a heap of trouble.

Water gets into aquifers through open areas, called recharge areas. These are places where water gets into the aquifers after flowing through the ground. This is true with deep aquifers, too. At some point they are closer to the surface, and that's where they get recharged.